NAVFAC YO817 Briefing

Technical POCs

Code 2362

619-553-5334

Computer Sciences Corporation

619-553-3320

Management POC

SSC San Diego, Code 236

619-553-5403

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Introduction

- BirdRad Is a Portable Radar Developed By The Radar Ornithology Laboratory At Clemson University
  - Funded By Legacy
- BirdRad Was Designed:
  - To Measure Diurnal & Seasonal Activity Of Birds In A 0-6 NM Radius Around Military Facilities
  - For Natural Resource Managers and BASH Coordinators

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Objectives

- NAVFAC Y0817 Tasked SSC San Diego To Make BirdRad System More Useable By:
  - Removing Ground Clutter From Radar Images
  - Automate Bird Tracks
  - Display Bird Data In A GIS
  - Develop A Software Program To Control The Collection Of Data
- SSC San Diego Undertook A Requirements Analysis To Define The Needs of BirdRad Users
  - Natural Resource Managers
  - BASH Coordinators
  - Air Safety Personnel

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Environmental Quality (EQ) Requirements

- **4.I.02.x** Improved Methods and Technologies for Conducting T&E and Natural/Cultural Resources Inventories (High Priority)

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Problem Statement/Regulatory Drivers

- Need: Improve Monitoring Methods For Natural Resource Managers To Sample Migratory & Resident Bird Populations
  - Integrated Natural Resource Management Plans (INRMP)
  - Migratory Bird Treaty Act/Endangered Species Act
    - DOD Partners In Flight
  - Bird Air Strike Hazard (BASH)
    - Damages From Documented Collisions Between Birds & Aircraft Total ~$1B/Yr Worldwide
    - Fatalities

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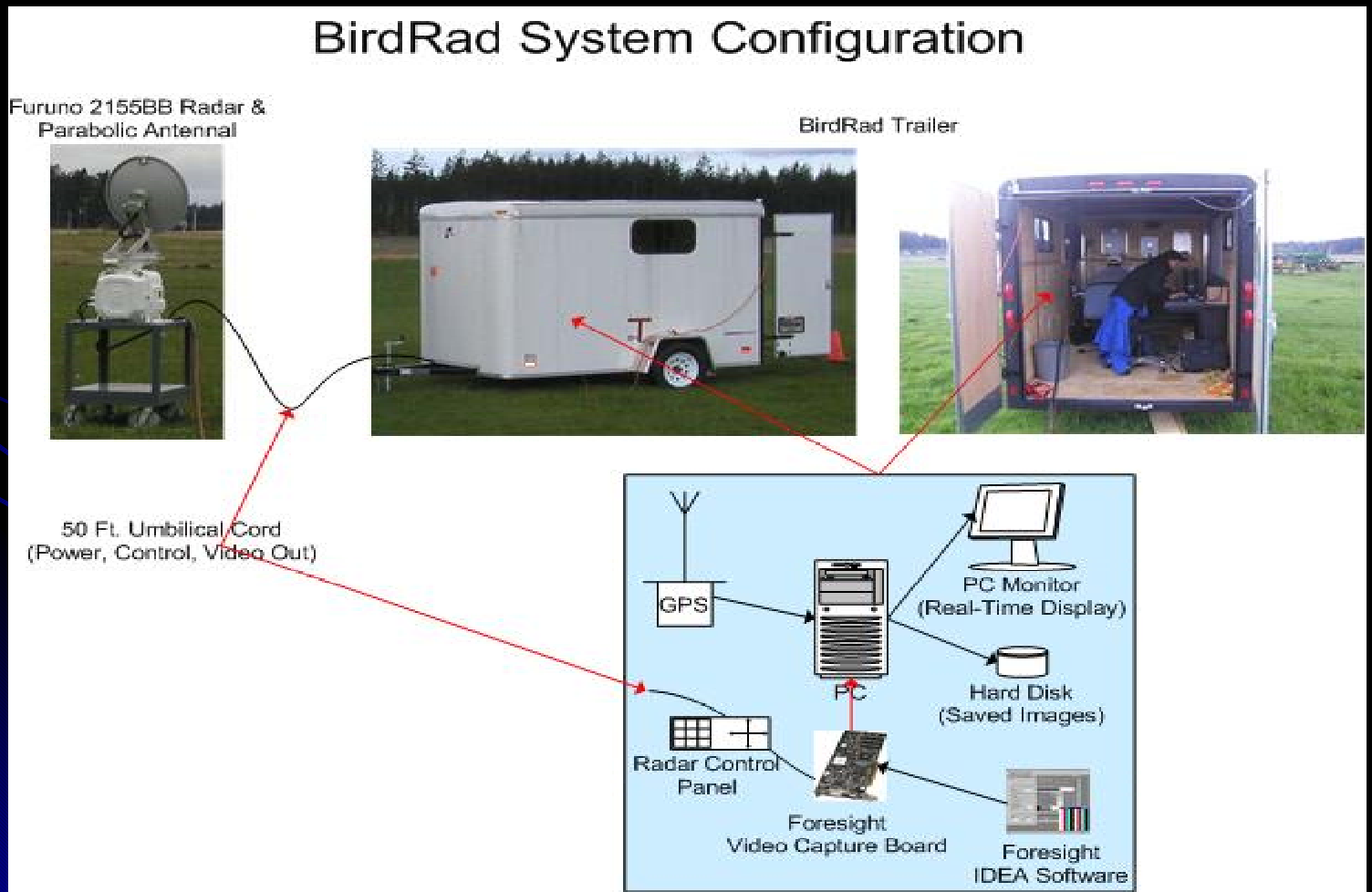
BirdRad Data Systems
BRDS

Current BirdRad System



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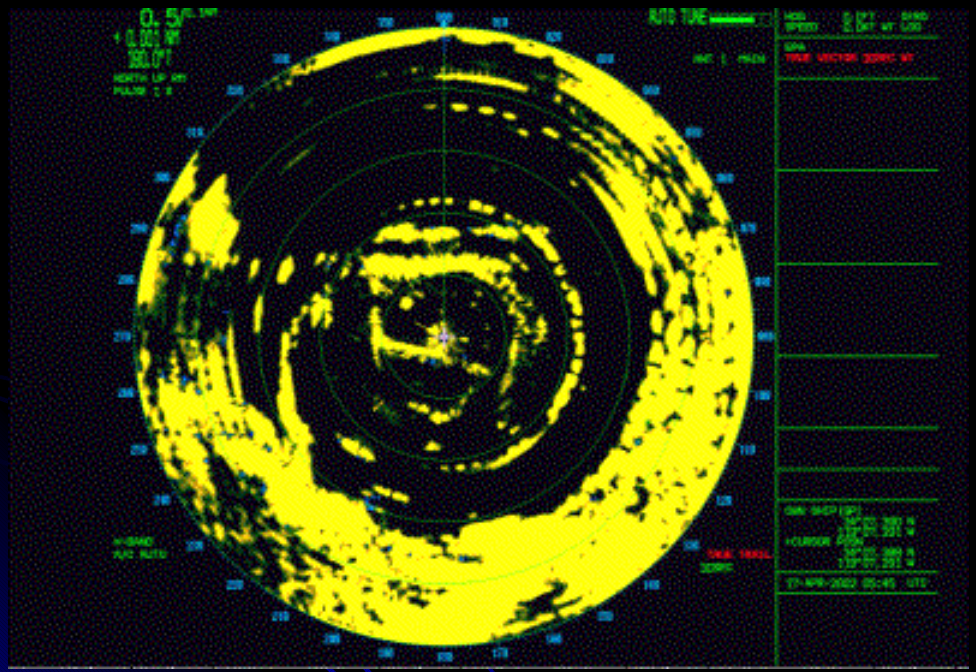
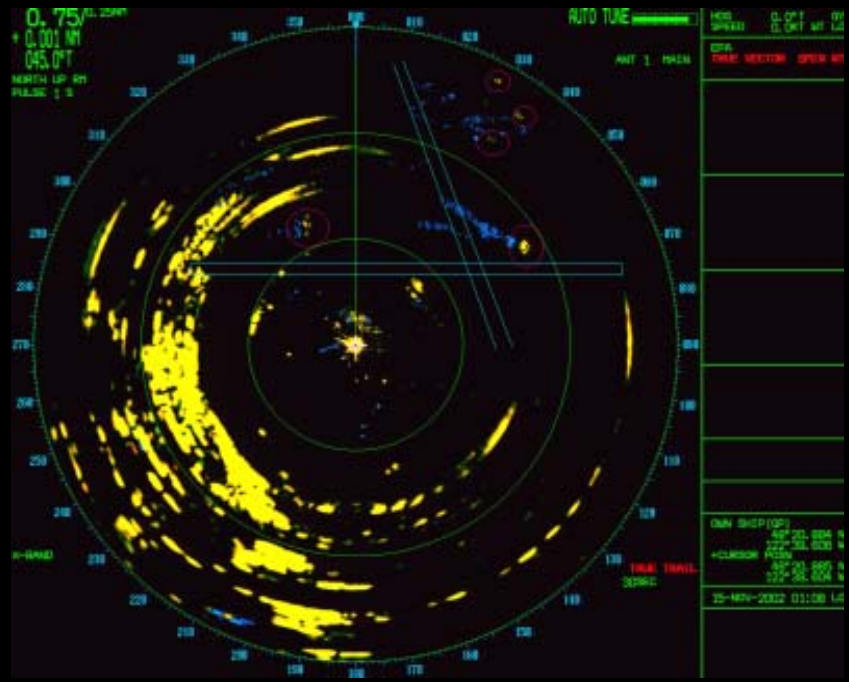
Examples of BirdRad Images





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Background: Technical Gaps

- Deployment Of BirdRad Identified Additional Requirements:
  - Remove Ground Clutter From Images
  - Automate Recognition Of Birds In BirdRad Images
  - Record Bird Siting Data In A Database For Subsequent Analysis Of Diurnal, Seasonal, And Other Patterns
  - Plot Extracted Bird Position & Velocity Data On GIS Coverage Maps (E.G., Base Maps, Facility Maps, Vegetation Maps)
  - Automated Control Of The Operation Of BirdRad

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Approach

- **Requirements Analysis**
- **Bird Detection**
  - Ground Clutter Obscures Targets
  - Detecting Birds
    - Parabolic Antenna - Narrow Beam
    - 360 Degree Field of View
  - Tracking Birds
    - Signal Processing/Algorithm Development vs Image Processing
      - Capture Rate of TIFF Images Cannot Keep Up
      - TIFF Files Are 4+Mb
      - Extracting Bird Data From TIFF Files Problematic
      - Both Expensive
  - Remote Viewing

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Approach

- **Database**
  - Store Abundance, Velocity And Behavior Data In Generalized Database
    - Support Diverse Client Applications
    - Support Different Views Of Data
    - Store Data From Other Sources (e,g. Bird Census Studies, ASR, & NEXRAD Images)
  - Analyze Patterns And Predict Future Activity
- **GIS**
  - Users Want To Visualize Bird Activity Relative To Facilities, Habitats, Topography, etc.

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Approach

- **Control Program**
  - Current Operation: Manual & Inadequate
    - Operation of Radar
    - Capture of Data
  - Requirement: Automated
    - Specify A Sampling Regime In Advance
    - Control Operation Of The Radar System
      - According To Predefined Sampling Plan
      - Remote Access

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BRDS Technical Approach

- Requirement Analysis
  - Process
    - Interviews (limited)
    - Questionnaire
      - Software
      - Hardware
      - Operations
      - Training
  - Methods
    - Unified Modeling Language (UML)
      - Use Cases
    - Web Site

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BRDS Technical Approach

Market Survey:

- Image Processing Not A Viable Solution
  - Signal Processing
- COTS Products
  - Avian Radars
    - Geo-Marine Inc. (MARS)
    - DeTect (Merlin)
  - Other/Homeland Security
    - Sicom System, Ltd (MT-Tracker)

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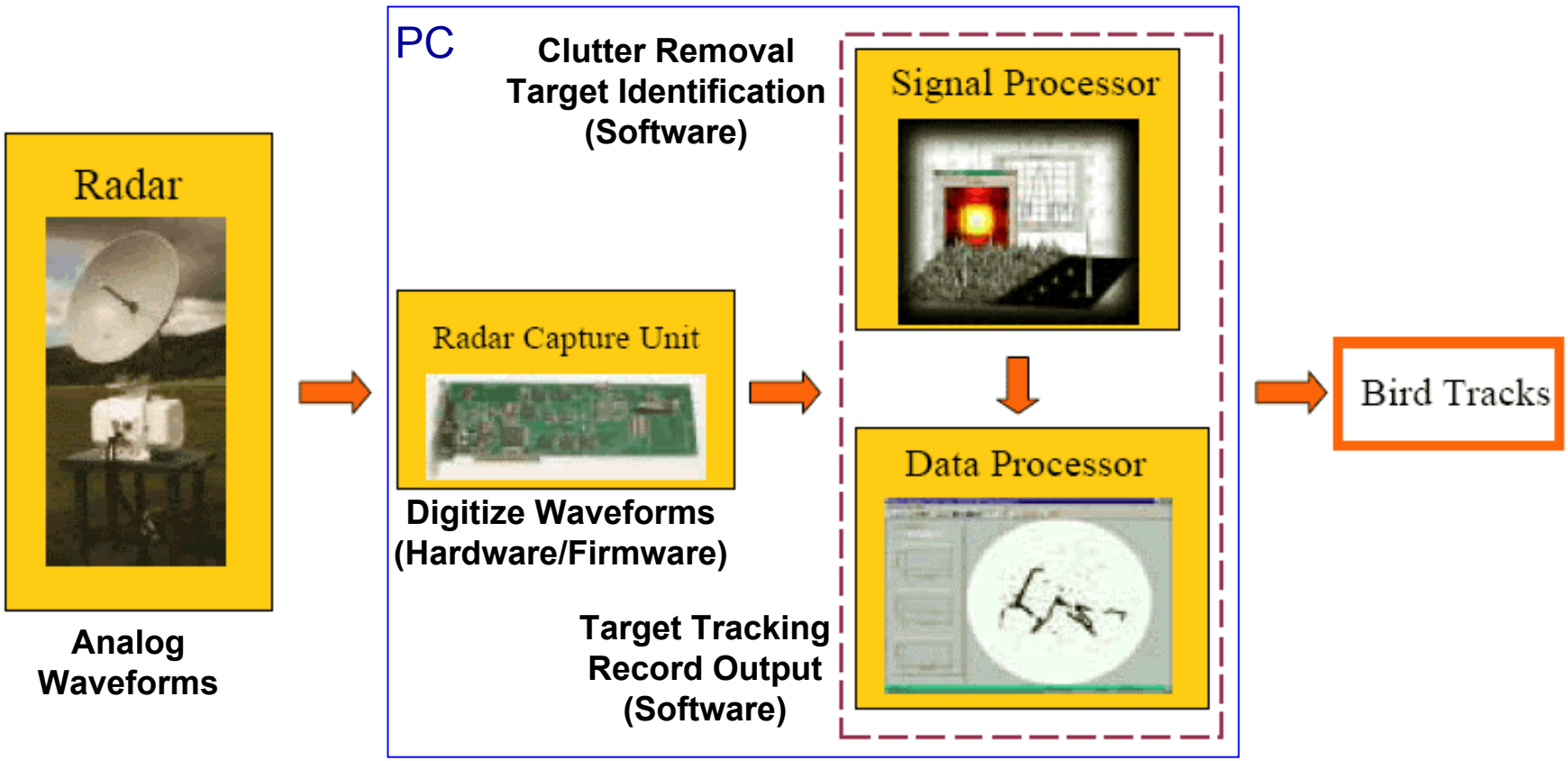
BirdRad Data Systems
BRDS

Example of Signal Processing



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Technology Description

- Competitive Contract – RFP
  - Split Signal Processing Into Two RFPs
    - Radar Capture Unit
    - Algorithm Development
  - Award Process

Technical Description

- **Deferred to FY05**
  - Algorithm Development
  - Database
  - GIS/Visualization
  - Control Program/Sampling Regime

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Technical Description

- .. And The Award Goes To..
- SICOM Systems Ltd.
  - Radar Capture Unit
    - Sigma Engineering Ltd Rsi4000RT High Resolution Radar Interface Card
    - MT-Tracker Radar Processor Software
      - Scan Conversion
      - Clutter Map CFAR Detection – Clutter Suppression
  - Algorithm Development
    - Adapt MT-Tracker Data Processor Multi-Target
    - Parameter Adjustments
    - Configured & Optimized For Bird Detection, Plotting & Tracking

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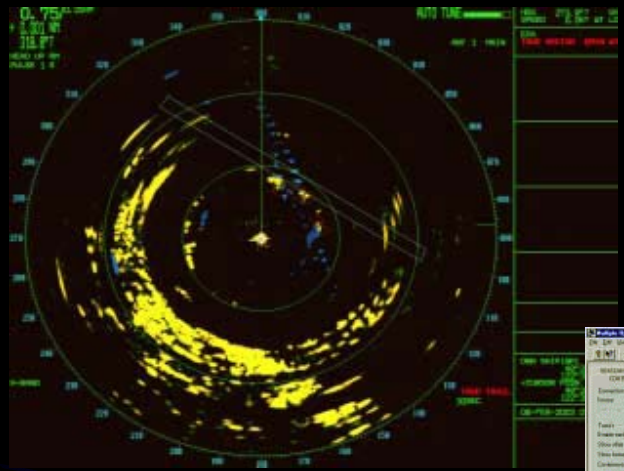
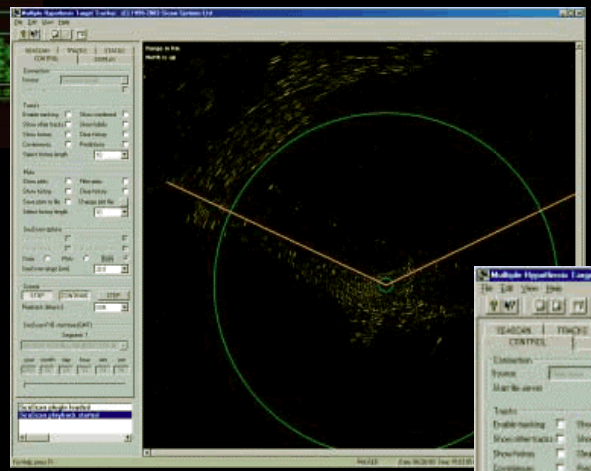
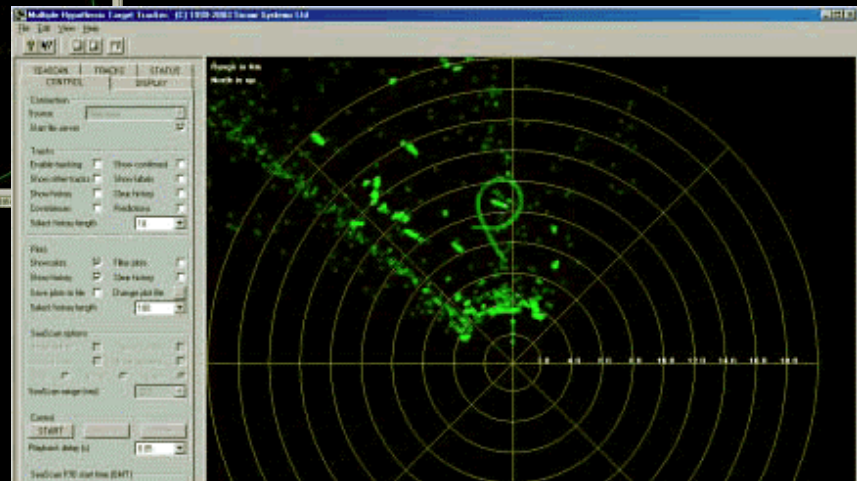
Technical Description cont..



Current BirdRad
Radar Image

CFAR Demonstrated Using
MT-Tracker Signal Processor





Plot Histories – Data Tracks Linked To Database

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Benefits ROI

- Current Cost & Methods of Collecting Data
  - Rudimentary
  - Loss Of Historical Data
- Natural Resource Tool (BASH)
  - Migratory Bird Treaty Act
  - Endangered Species Act
  - INRMP
  - Habitat Modification
  - Locate & Predict Seasonal Bird Patterns
- Standards-Based
  - Web Services/Open Architecture
- Reduce Bird Strikes (Costly, Fatalities)

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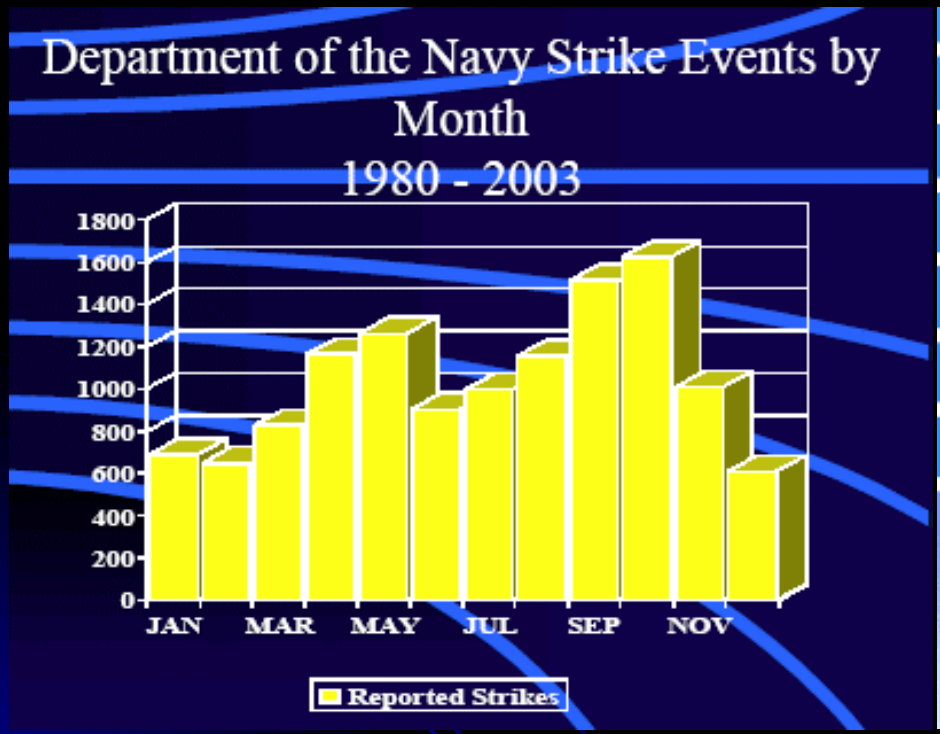
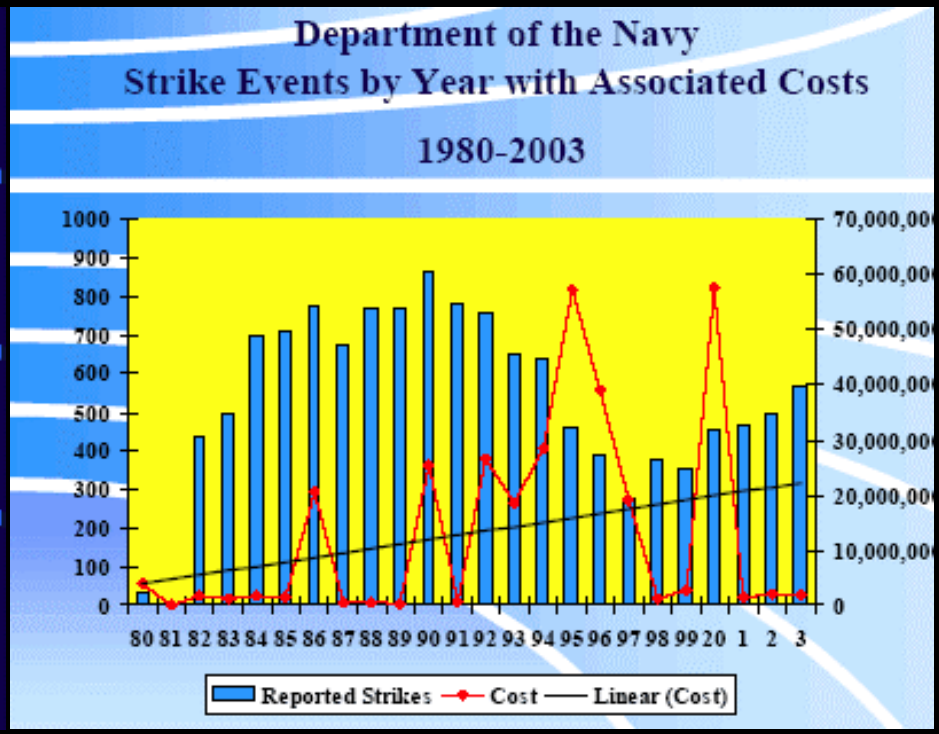
BirdRad Data Systems BRDS

Benefits ROI cont…





Ref. Matt Klope Navy BASH Manager

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Milestones/Deliverables

	MILESTONES	FY03				FY04				FY05				FY06
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
1	Requirements Analysis													
2	BirdRad Web Site													
3	Collection/Analysis													
4	RFP Process													
5	Remote Control Unit													
6	Algorithm Development													
7	Link													
8	Panel													
9	Configuration Management													
11	Database													
12	GIS													
13	Product													
14	Training & Technical Support													

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Project Coordination

- SSC-SD
- CSC
- BirdRad Users (Navy, Marine Corps, Air Force)
- Clemson University
- NFESC
- Legacy
- Sicom Systems Ltd.
  - SERDP
    - Lincoln Labs
    - PIF
    - USGS
    - USArmy

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Technical Accomplishments

- FY03 - Requirements Analysis
  - Use Case Analysis
- FY03 - Web Site
  - Troubleshooting
  - Manuals
  - Research/Information/Instructions
- FY03 - Site Visits
  - Identify Areas Of Concern
  - Pt Mugu Computer Repairs
- FY04 - RFP
  - Solicitation
  - Contract Review & Award
- FY04 - Field Test & Data Collection

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Implementation Strategy

- FY03 – Completed
  - Created the BirdRad Web Site
  - Two Visits To Pt. Mugu, CA
  - Attended Two Meetings at SSC Charleston
  - Attended Bird Strike Conference at Sacramento, CA
  - Prepared Software Requirements Documents for ORD (Sallee)
  - Researched Radar/Image Processing Alternatives
  - Visited Whidbey Island, WA
    - Designed a Test Plan/Data Collection
  - Completed BirdRad Software Enhancement Requirements Analysis
  - Ground Clutter/Bird Detection (GC/BD)
    - Sicom Systems Ltd. Evaluation of Furuno Radar Unit

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Implementation Strategy Cont..

- FY04 – Completed
  - Site Visits/Data Collection
    - Whidbey Island – Matt Klope NFESC Bash Coordinator – Data Collection – Systems Analysis
    - Pt. Mugu - Laura Muhs NFESC – RFP Data Collection – System Repair
  - RFP Procurement
    - CSC – Gerry Key (Technical Review), Jeanette C Rivero (Contracts)
    - Sicom Systems Ltd. – Dr. Tim Norhara (Lead)
  - Acquired BirdRad Trailer
- FY04 - Remaining
  - Remote Capture Unit
    - Benefits To All Natural Resource/BASH Managers
  - Partial Algorithm Development
    - Benefits All Natural Resource/BASH Managers

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Implementation Strategy Cont..

- FY05 – Benefits to all Users
  - Sampling Regime
  - Configuration Management
  - Database
  - GIS/Visualization
  - Demo
  - Technical Instructions & Training

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Funding Status

	Amount ($K)	Expenditures as of 05/10/2004
FY03 Received	300	300
FY03 Carryover	117	NA
FY04 Received	160	NA
FY05 Proposed	250	NA
FY06 Proposed	100	NA

*US Marine Corp $75

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Issues & Concerns

- MONEY
  - Algorithm Development FY05 funding
- User Interface Requirement
- Trailer Funding?
  - Redesign
- Maintenance
  - Who Pays For Maintenance Of Fielded Units?
- Network Centric
  - FORCEnet-capable
  - Web Services
- Legacy Comparison Study

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Issues & Concerns cont…

NMCI

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Logic Model

Navy Benefits	Aid the Natural Resource managers to monitor and continuously sample bird activity in and around the airfield. Reduce cost (lives and dollars) of air strikes.
Customer Capability	Natural Resource & BASH managers can sample 24/7 and view near-real time bird activity on top of GIS layers in their office using any web browser.
Products	A near-real time mobile radar system that removes ground clutter, tracks birds, saves data in a database, and displays bird targets on geographical information systems (GIS) military base map layers to measure the distribution and abundance of wildlife. Make scheduled or incidental observations of the distribution and abundance of wildlife at the airfield. Application will be browser-based to control the BirdRad system remotely.
Project Milestones	MS#5 RCU 3Q FY04 MS#6 ALGO Development 4Q FY04 MS#8 Sampling Regime/Control Panel 1Q FY05 MS#11 Database (including automation) 2Q FY05 MS#12 GIS 3Q FY05

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BirdRad Data Systems
BRDS

Summary

Current System

Enhancements

Ground Clutter Removal

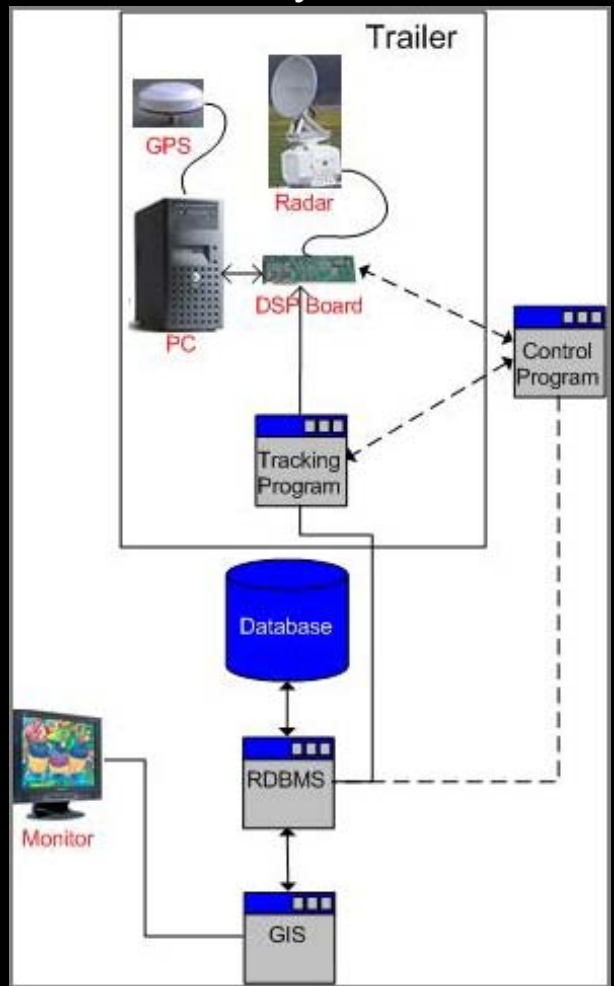
Bird Tracking

GIS

Control Panel

Automated Link DB

Future System



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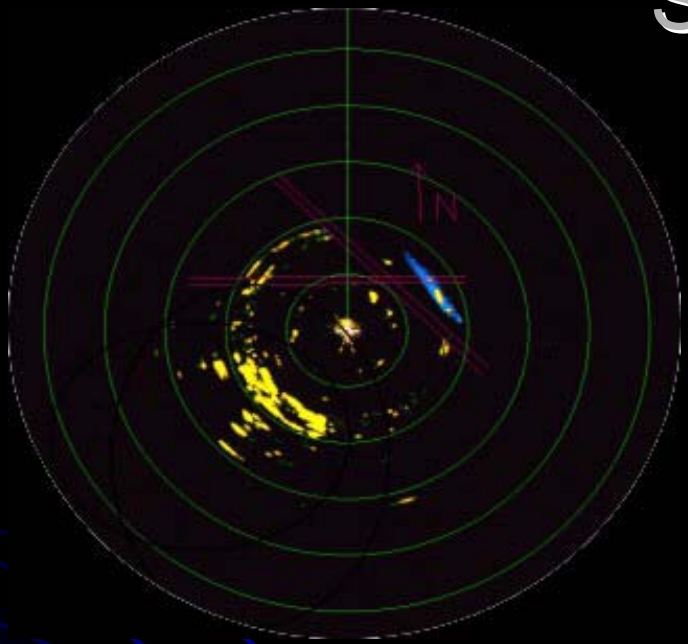
BirdRad Data Systems
BRDS

Summary



Current Data System
- Analog (Video)
- Image Files
- Manual Operation
- No Base Maps
- Heavy Ground Clutter

Future Data System
- Digital
- Automated Ground Clutter Removal, Identification & Tracking of Birds
- Database
- GIS (Desktop/Web-based)
- Wireless LAN
- Automated Control

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THAT's ALL FOLKS!!!